

WHAT IS CLAIMED IS:

1. Apparatus for identifying a digital audio signal, comprising:

an input which receives the digital audio signal;

and

5 structure configured to (i) identify a program-identifying code in the received digital audio signal, (ii) identify a program-identifying code in a decompressed or uncompressed received digital audio signal, (iii) identify a feature signature in the received digital audio signal, and
10 (iv) identify a feature signature in the decompressed or uncompressed received digital audio signal.

2. Apparatus according to Claim 1, wherein said structure time-stamps the identified signals.

3. Apparatus according to Claim 2, further comprising a clock which supplies a clock signal to said structure.

4. Apparatus according to Claim 2, further comprising a memory for storing the time-stamped identified signals.

5. Apparatus according to Claim 4, further comprising transmission structure for transmitting the stored, time-stamped identified signals to a collection site.

6. Apparatus according to Claim 1, wherein said structure is disposed in a dwelling.

7. Apparatus according to Claim 1, wherein said structure is disposed in a verification site.

8. Apparatus according to Claim 1, wherein said structure is disposed in a monitoring site.

9. Apparatus according to Claim 1, further comprising a tuner which receives a broadcast program signal and outputs the digital audio signal to said input.

10. Apparatus according to Claim 1, wherein the program-identifying code is placed in an aux data field in the digital audio signal by a broadcaster and/or a program producer.

11. Apparatus according to Claim 10, wherein the program identifying code is Program System Information Protocol (PSIP) data, Content ID data, and/or other useful data which are placed in the aux data field by the broadcaster and/or any other participant in the distribution system.

12. Apparatus according to Claim 10, wherein the program identifying code is program related data which are copied from bitstream data areas outside the aux data field into the aux data field by the broadcaster and/or other participant in the distribution system.

13. Apparatus according to Claim 10, wherein the Stuffing is altered with data which corresponds to viewing activity information.

14. Apparatus according to Claim 10, wherein the program-identifying code and the feature signal correspond to an Internet transmission.

15. Signal identification structure which receives an input digital audio signal, comprising:

signal processing structure configured to perform at least one of: (i) determining an identification code from a portion of a compressed received input digital audio signal, and extracting a signature from a portion of said compressed received input digital audio signal; and (ii) determining an identification code from a portion of an uncompressed received input digital audio signal, and extracting a signature from a portion of said uncompressed received input digital audio signal.

16. Structure according to Claim 15, wherein said signal processing structure performs both (i) and (ii).

17. Apparatus according to Claim 15, wherein said processing structure time-stamps determined and/or extracted signals.

18. Apparatus according to Claim 17, further comprising a clock which supplies a clock signal to said processing structure.

19. Apparatus according to Claim 17, further comprising a memory for storing the time-stamped signals.

20. Apparatus according to Claim 19, further comprising transmission structure for transmitting the stored, time-stamped signals to a collection site.

21. Apparatus according to Claim 15, wherein said processing structure is disposed in a dwelling.

22. Apparatus according to Claim 15, wherein said processing structure is disposed in a verification site.

23. Apparatus according to Claim 15, wherein said processing structure is disposed in a monitoring site.

24. Apparatus according to Claim 15, further comprising a tuner which receives a broadcast program signal

and outputs the digital audio signal to said processing structure.

25. A method for identifying a digital audio signal, comprising the steps of:

receiving the digital audio signal at an input;

and

5 configuring processing structure to (i) identify a program-identifying code in the received digital audio signal, (ii) identify a program-identifying code in a decompressed received digital audio signal, (iii) identify a feature signature in the received digital audio signal, and
10 (iv) identify a feature signature in the decompressed received digital audio signal.

26. A method according to Claim 25, wherein said processing structure time-stamps the identified signals.

27. A method according to Claim 26, further comprising the step of supplying a clock signal to said processing structure.

28. A method according to Claim 26, further comprising the step of storing the time-stamped identified signals.

29. A method according to Claim 28, further comprising the step of transmitting the stored, time-stamped identified signals to a collection site.

30. A method according to Claim 25, wherein said processing structure is disposed in a dwelling.

31. A method according to Claim 25, wherein said processing structure is disposed in a verification site.

32. A method according to Claim 25, wherein said processing structure is disposed in a monitoring site.

33. A method according to Claim 25, further comprising the step of using a tuner to receive a broadcast program signal and output the digital audio signal to said input.

34. A signal identification process which receives an input digital audio signal, comprising the steps of:

performing at least one of:

5 i) determining an identification code from a portion of a compressed received input digital audio signal, and extracting a signature from a portion of said compressed received input digital audio signal; and

10 ii) determining an identification code from a portion of an uncompressed received input digital audio signal, and extracting a signature from a portion of said uncompressed received input digital audio signal.

35. A process according to Claim 34, wherein both (i) and (ii) are performed.

36. A process according to Claim 34, further comprising the step of time-stamping determined and/or extracted signals.

37. A process according to Claim 36, further comprising the step of supplying a clock signal to at least

one of said determining steps.

38. A process according to Claim 36, further comprising the step of storing the time-stamped signals.

39. A process according to Claim 38, further comprising the step of transmitting the stored, time-stamped signals to a collection site.

40. A process according to Claim 35, wherein said determining step is performed in a dwelling.

41. A process according to Claim 35, wherein said determining step is performed in a verification site.

42. A process according to Claim 35, wherein said determining step is performed in a monitoring site.

43. A process according to Claim 35, further comprising the step of using a tuner to receive a broadcast program signal and output the digital audio signal to said determining step.

44. A process according to Claim 35, further comprising the step of decompressing the received digital audio signal.

45. A computer readable storage medium which causes one or more computers to carry out a method for identifying a digital audio signal, the computer readable storage medium causing the one or more computers to perform the steps of:

inputting the digital audio signal; and

configuring processing structure to (i) identify a program-identifying code in the received digital audio signal, (ii) identify a program-identifying code in a decompressed received digital audio signal, (iii) identify a feature signature in the received digital audio signal, and (iv) identify a feature signature in the decompressed received digital audio signal.

46. A computer readable storage medium according to Claim 45, wherein said processing structure is configured to time-stamp the identified signals.

47. A computer readable storage medium according to Claim 46, further comprising the step of supplying a clock signal to said processing structure.

48. A computer readable storage medium according to Claim 46, further comprising the step of storing the time-stamped identified signals.

49. A computer readable storage medium according to Claim 48, further comprising the step of transmitting the stored, time-stamped identified signals to a collection site.

50. A computer readable storage medium according to Claim 45, wherein said processing structure is disposed in a dwelling.

51. A computer readable storage medium according to Claim 45, wherein said processing structure is disposed in a verification site.

52. A computer readable storage medium according to Claim 45, wherein said processing structure is disposed in a monitoring site.

53. A computer readable storage medium according to Claim 45, further comprising the step of using a tuner to receive a broadcast program signal and output the digital audio signal to said processing structure.

54. A computer readable storage medium which causes one or more computers to carry out a signal identification process which receives an input digital audio signal, the computer readable storage medium causing the one or more computers to perform the steps:

performing at least one of:

i) determining an identification code from a portion of a compressed received input digital audio signal, and extracting a signature from a portion of said compressed received input digital audio signal; and

ii) determining an identification code from a portion of an uncompressed received input digital audio signal, and extracting a signature from a portion of said

uncompressed received input digital audio signal.

55. A computer readable storage medium according to Claim 54, wherein both (i) and (ii) are performed.

56. A measurement apparatus for determining which of a plurality of digitally broadcast program signals is tuned by a broadcast receiver apparatus having a receiver output connector for outputting a digital audio signal, the measurement apparatus comprising:

an input connector configured to connect the measurement apparatus to the receiver output connector;

a repeater circuit configured to receive the digital audio signal and to supply a repeated copy thereof to an output connector portion of the measurement apparatus;

a clock configured to supply a read time output;

a decoding circuit having an input from the clock, the decoding circuit configured to read an ancillary code from the digital audio signal and to associate a read time therewith;

a signature extractor having an input from the clock, the signature extractor configured to extract a

digital signature from the digital audio signal and to
associate the read time therewith;

20 a memory configured to store a plurality of data
records, each of the data records comprising a respective
read time and at least one of the ancillary code associated
therewith and the digital signature associated therewith;
and

25 a communication device configured to communicate
the plurality of data records to a data collection facility.

57. The measurement apparatus of Claim 56,
wherein the digital signal comprises a sequence of frames,
each of the frames comprising a respective auxiliary data
field configured to contain the ancillary code, each of the
frames further comprising a predetermined portion usable as
the digital signature.

58. The measurement apparatus of Claim 56,
further comprising:

 a signal decompression circuit for converting the
sequence of frames into a PCM digital signal;

5 a second decoding circuit configured to receive

the PCM signal, to extract an embedded second ancillary code therefrom, and to associate the read time therewith;

a second signature extractor configured to receive the PCM signal, to extract a second digital signature therefrom and to associate the read time therewith; and

wherein each of the data records further comprises at least one of the embedded code and the second digital signature.

59. The measurement apparatus of Claim 56, wherein the digital signal comprises a PCM signal having the ancillary code embedded therein.

60. The measurement apparatus of Claim 56, further comprising structure which determines whether the digital audio signal output from the receiver is anon-linear PCM encoded audio bitstream signal or the linear PCM audio signal.

61. The measurement apparatus of Claim 56, wherein the receiver output connector comprises a SP/DIF connector.

62. A method for generating a time-stamped tuning record for determining which one of a plurality of program signals is selected at a receiving site by a receiver apparatus having a receiver output connector configured to output a digital audio signal uniquely associated with the selected one of the program signals, the digital audio signal comprising a sequence of frames, the method comprising the steps of:

receiving the digital audio signal from the receiver output connector;

supplying a repeated copy of the digital audio signal to an output connector other than the receiver output connector;

attempting to read, from a predetermined field of one of the frames, a respective first ancillary code from the digital audio signal;

copying a predetermined portion of one of the frames as a respective first digital signature;

assembling the time-stamped tuning record from a read time datum representing a time at which the one of the frames was received from the receiver output connector and at least one of the first ancillary code and the first

digital signature; and

communicating the time-stamped record to a data
collection facility.

63. The method of Claim 62, comprising the
additional steps of:

decompressing anon-linear PCM encoded audio
bitstream signal to yield a linear PCM signal;

attempting to read, from the linear PCM signal, a
second ancillary code embedded therein; and

extracting a second digital signature from the
linear PCM signal;

wherein the step of assembling the time-stamped
record comprises including at least one of the second
ancillary code and the second digital signature therein.

64. The method of Claim 62, wherein the
predetermined portion copied as the first digital signature
comprises a checksum field.

65. The method of Claim 62, wherein the
predetermined field comprises an auxiliary data field.

66. The method of Claim 62, wherein the digital audio signal comprises a signal having an AC-3 format.

67. A method for generating a time-stamped tuning record for determining which one of a plurality of program signals is selected at a receiving site at a read time by a receiver apparatus having a receiver output connector
5 configured to output a digital audio signal, the digital audio signal uniquely associated with the selected one of the program signals, the method comprising the steps of:

receiving the digital audio signal from the receiver output connector;

10 attempting to read an ancillary code embedded in the digital audio signal;

extracting a digital signature from the digital audio signal;

assembling the time-stamped tuning record from the
15 read time and at least one of the ancillary code and first digital signature; and

communicating the time-stamped record to a data collection facility.

68. The method of Claim 67, further comprising a step of outputting a repeated copy of the digital audio signal.

69. The method of Claim 67, wherein the selected program signal comprises a broadcast program signal.

70. The method of Claim 67, wherein the selected program signal is generated from consumer program signal storage equipment disposed with the receiver apparatus in a dwelling.

71. A measurement apparatus for determining which of a plurality of program signals is selected by a receiver apparatus having an SP/DIF output connector for outputting a receiver output digital audio signal uniquely associated with the selected program signal, the receiver output digital audio signal having one of a non-linear PCM encoded audio bitstream signal format and a linear PCM audio signal format, the measurement apparatus comprising:

an input connector configured to connect the measurement apparatus to the SP/DIF output connector;

a clock configured to supply a read time output;

a first decoding circuit configured to receive the read time output, the first decoding circuit configured to read an ancillary code from the digital audio signal if the digital audio signal has the non-linear PCM encoded audio bitstream format and to associate a read time therewith;

a first signature extractor configured to receive the read time output, the first signature extractor configured to extract a first digital signature from the digital audio signal if the digital audio signal has the non-linear PCM encoded audio bitstream format and to associate the read time therewith;

a signal decompression circuit configured to convert the receiver output digital audio signal to a converted linear PCM audio signal if the digital audio signal has the non-linear PCM encoded audio bitstream format;

a second decoding circuit configured to receive the read time output, the second decoding circuit configured to read an embedded code from one of the receiver output PCM digital audio signal and the converted linear PCM audio signal and to associate the read time therewith;

a second signature extractor configured to receive the read time output, the second signature extractor
35 configured to extract a second digital signature from one of the receiver output PCM digital audio signal and the converted PCM digital audio signal, and to associate the read time therewith;

40 a memory configured to store a plurality of data records, each of the data records comprising a respective read time and at least one of the respective first ancillary code, the respective first digital signature, the respective embedded code and the respective second digital signature associated therewith; and

45 communication means configured to communicate the plurality of data records to a data collection facility.

72. The measurement apparatus of Claim 71, wherein the first digital signature comprises a copy of a predetermined portion of the non-linear PCM encoded audio bitstream signal.

73. The measurement apparatus of Claim 72, wherein the first decoding circuit is configured to read the

ancillary code from an auxiliary data field portion of the non-linear PCM encoded audio bitstream signal.

74. The measurement apparatus of Claim 72, further comprising a repeater circuit configured to receive the receiver output digital audio signal and to supply a repeated copy thereof to an output connector portion of the measurement apparatus.

75. The measurement apparatus of Claim 72, wherein the communication means comprises a modem portion of a data storage and forwarding apparatus and wherein the data storage and forwarding apparatus comprises the memory configured to store the plurality of data records.

76. A method for generating a time-stamped tuning record for determining which of a plurality of program signals is selected at a receiving site by a receiver having a receiver output connector configured to output a receiver output digital audio signal in either a linear PCM format or a non-linear PCM encoded audio bitstream format, the receiver output digital audio signal uniquely associated

with a selected one of the program signals, the method comprising the steps of:

10 receiving the receiver output digital audio signal from the receiver output connector;

 determining if the receiver output digital audio signal is the non-linear PCM encoded audio bitstream signal or the linear PCM signal;

15 if the receiver output digital signal is the non-linear PCM encoded audio bitstream signal, attempting to read, from a predetermined field of each frame, a first ancillary code from the receiver output digital signal;

 if the receiver output digital signal is a non-linear PCM encoded audio bitstream signal, copying a
20 predetermined portion of each frame as a first digital signature;

 if the receiver output digital signal is a non-linear PCM encoded audio bitstream signal, decompressing the
25 non-linear PCM encoded audio bitstream signal to yield a decompressed PCM digital signal;

 attempting to read, from one of the receiver output PCM digital signal and the decompressed PCM digital signal, a second ancillary code embedded therein;

30 extracting a second digital signature from one of
the receiver output PCM digital signal and the decompressed
PCM digital signal;

assembling the time-stamped tuning record from a
read time datum and at least one of the first ancillary
35 code, the first digital signature, the second ancillary code
and the second digital signature; and

communicating the time-stamped record to a data
collection facility.

77. The method of Claim 76, further comprising a
step of comparing, at the data collection facility, data
from the time-stamped record with corresponding data from at
least one of a plurality of time-stamped reference tuning
50 records, each of the reference tuning records comprising a
copy of the predetermined portion of each frame of a digital
broadcast signal broadcast from a source receivable at the
receiving site and a reference digital signature extracted
from a decompressed PCM digital signal obtained from the
10 digital broadcast signal.

78. The method of Claim 76, further comprising a step of repeating the received output digital audio signal at an output connector other than the receiver output connector.

79. The method of Claim 76, further comprising a step after the step of assembling the tuning record and before the step of communicating the tuning record to a data collection facility of storing the tuning record in a memory portion of a data storage and forwarding apparatus.

80. A broadcast audience measurement method for determining which one of a predetermined number of broadcast signals is tuned by a receiving apparatus at a statistically selected tuning site at a plurality of tuning times, wherein each of the broadcast signals comprises a respective digital audio component formatted as a respective sequence of data frames, and wherein the receiving apparatus comprises an output connector supplying the digital audio signal, the method comprising the steps of:

selecting a subset of the data frames from the tuned broadcast signal;

associating a respective tuning time with each of
the data frames in the subset;

storing a set of tuning records in a tuning memory
15 at the tuning site, each of the tuning records comprising a
copy of a predetermined portion of a respective data frame
in the subset and the respective tuning time;

communicating the set of tuning records to a
central data collection facility;

20 receiving the predetermined number of broadcast
signals at at least one reference site, and storing a
respective set of time-stamped reference records in a
reference memory, each of the sets of reference records
comprising a copy of the predetermined portion of each of
25 the data frames of the digital audio component associated
with a respective one of the broadcast signals;

communicating the sets of reference records to the
central data collection facility; and

comparing, at the central data collection
30 facility, the set of tuning records with ones of the sets of
reference records to determine which of the broadcast
signals is the tuned broadcast signal.

81. The method of Claim 80, wherein at least one of the tuning records comprises an ancillary code read from an auxiliary data field portion of the respective at least one of the frames.

82. The method according to Claim 80, wherein the auxiliary data field portion includes skip bits rather than auxiliary data.